

PGPUB-DOCUMENT-NUMBER: 20020123930

PGPUB-FILING-TYPE: new

DOCUMENT-IDENTIFIER: US 20020123930 A1

TITLE: Promotion pricing system and method

PUBLICATION-DATE: September 5, 2002

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US-CL-CURRENT: 705/14, 705/10

ABSTRACT: The present invention provides a promotion pricing system and a related model for producing a value evaluation and recommendation for promotion on a targeted product so as to analyze, evaluate, improve, and design promotions to meet a user's need. The promotion pricing system generates promotion price evaluations and recommendations for each product promotion related to a target product of a user along with associated competing products from the user and competitors. The user can be an individual, an organization, a corporation, an association or any entity providing, including activities related to making, selling, resale, offering for sale, distributing and other commercial conducts, products or service or both in the stream of commerce. In the preferred embodiment, the promotion pricing system of the presenting invention is comprised of modularization of the necessary analytical steps along with specifications for these modules. These modules cooperate to implement statistical market response estimation that provide statistically stable, fact-based information on customer response to a promotions. The modules further allow data capture to leverages enterprise and supply chain data sources. The modules include a product segmentation module, an incentive translation module, a customer segmentation module, a data aggregation module, a model selection module, a calibration module, an evaluation module, a constraints generation module, a cost structure module, an optimization module, a market channel performance module, and an alert module.

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Abstract Paragraph - ABTX (1): The present invention provides a promotion pricing system and a related model for producing a value evaluation and recommendation for promotion on a targeted product so as to analyze, evaluate, improve, and design promotions to meet a user's need. The promotion pricing system generates promotion price evaluations and recommendations for each product promotion related to a target product of a user along with associated competing products from the user and competitors. The user can be an individual, an organization, a corporation, an association or any entity providing, including activities related to making, selling, resale, offering for sale, distributing and other commercial conducts, products or service or both in the stream of

commerce

Abstract Paragraph - ABTX (2): In the preferred embodiment, the promotion pricing system of the presenting invention is comprised of modularization of the necessary analytical steps along with specifications for these modules. These modules cooperate to implement statistical market response estimation that provide statistically stable, fact-based information on customer response to a promotions. The modules further allow data capture to leverages enterprise and supply chain data sources. The modules include a product segmentation module, an incentive translation module, a customer segmentation module, a data aggregation module, a model selection module, a calibration module, an evaluation module, a constraints generation module, a cost structure module, an optimization module, a market channel performance module, and an alert module.

Summary of Invention Paragraph - BSTX (8): [0006] In response to these and other needs, the present invention provides a promotion pricing system and a related model for producing a value evaluation and recommendation for promotion on a targeted product so as to analyze, evaluate, improve, and design promotions to meet a user's need. The promotion pricing system generates promotion price evaluations and recommendations for each product promotion related to a target product of a user along with associated competing products from the user and competitors. The user can be an individual, an organization, a corporation, an association or any entity providing, including activities related to making, selling, resale, offering for sale, distributing and other commercial conducts, products or service or both in the stream of commerce.

Summary of Invention Paragraph - BSTX (9): [0007] The promotion pricing system of the present invention is general enough to provide price evaluations and recommendations with varying degrees of available data. While the ideal client for the system would maintain data on lost customers, competitor prices, industry availability and the like, most clients will have data on only a subset of the potential drivers of market response. In this way, the system enables the user to obtain valuable insight from the evaluation of a promotion program even with a minimum amount of input data and then increasing that value through increased forecasting accuracy and accurate evaluation as new and/or existing data is integrated.

Summary of Invention Paragraph - BSTX (10): [0008] The promotion pricing system of the present invention enables the user to determine the impact of proposed promotions before committing to the promotion. Using historical data and statistically derived market response models, the promotion pricing system tests promotional scenarios and forecasts the results. The user can then determine how much each proposed promotion will affect revenues, profits, and sales volumes; how much each promotion will reduce on-hand inventory, how different customer segments will respond to different promotions, and which combination of promotions will generate the highest return on your promotional expenditures. In one embodiment, the promotion pricing system can simultaneously consider cannibalization effects of the promotion on other products or channels, allowing the user to maximize overall revenue growth.

Summary of Invention Paragraph - BSTX (14): [0012] In the preferred embodiment, the promotion pricing system of the presenting invention is comprised of modularization of the necessary

analytical steps along with specifications for these modules. These modules cooperate to implement statistical market response estimation that provide statistically stable, fact-based information on customer response to a promotions. The modules further allow data capture to leverages enterprise and supply chain data sources. The modules include a product segmentation module, an incentive translation module, a customer segmentation module, a data aggregation module, a model selection module, a calibration module, an evaluation module, a constraints generation module, a cost structure module, an optimization module, a market channel performance module, and an alert module.

Detail Description Paragraph - DETX (2): [0018] As generally illustrated in FIG. 1A, the present invention provides a promotion pricing system 100 for producing and evaluating promotion pricing strategies. In particular, a user may employ the present invention to evaluate historical data to determine a more ideal promotional strategy to accomplish various business goals, such as increasing total sales volumes or increasing sales in certain desired market segments. The promotion pricing system functions to either propose a promotional strategy or to evaluate the expected effect of a promotional policy provided by the user. The promotion pricing system 100 works by defining market by specifying the various products in the market, as well as the suppliers (i.e., sellers in the market) and demanders (i.e., consumers). The promotion pricing system 100 then looks to historical market data to create a market model which may be used to determine various information, such as profit or sales maximizing sales conditions.

Detail Description Paragraph - DETX (6): [0022] Product information is part of the base data required by the promotion pricing system 100. The product information consists of basic product information on pricing, costs, inventory and product hierarchies. Likewise, account information provides account or customer profile information. This data is used to micro-segment the market and target different customer profiles with customized promotions. Channel information encompasses data on both inbound Sales channels (via which customers purchase system 100s or services) and outbound Marketing channels (through which customers are presented with promotional campaigns). The promotion pricing system 100 uses this information to incorporate sales channel-specific buying behavior, price elasticity, and costs. Information on outbound channels is used to model marketing channel-specific cost distinctions and response variations. Overall, product, account, and channel information form the base data for the promotion pricing system 100.

Detail Description Paragraph - DETX (7): [0023] Purchase, or sales order, data drives the analysis of the promotion pricing system. Sales order information answers the question of "who bought what at what price when and how," where the "who" identifies the customer segment or profile of the customer; the "what" the set of products or services on offer; the "price" the pricing information associated with the sale, including any promotion information if relevant, and the "when" the timing of the purchase; and the how the channel or medium used for the sales transaction. Ideally, both the user's own sales order and competitive sales order information is available for the promotion pricing system 100 to model competitive factors. However, alternatives exist, as described below.

Detail Description Paragraph - DETX (8): [0024] Competitive information forms another component driving the system 100's analysis of promotional schemes. This data identifying competitors helps to establish the competitive landscape. In addition to this base competitive data, raw sales order or market share data may be used to incorporate competitive information into the analysis. As laid out below, this information could manifest itself in either transaction or market share data. Competitive sales order data consist of sales transaction data on competitive products. If unavailable to the user, the Sales Order data could potentially be obtained from various third-party sources depending on the user's industry. In the event that Competitive Sales Order data is unavailable, the promotion pricing system 100 can use market size and market share information to model competitive factors. However, this lack of information may curtail the effectiveness of the competitive model.

Detail Description Paragraph - DETX (10): [0026] Using the above-described inputs, the promotion pricing system 100 analyzes a promotion scheme and produces several outputs, including promotion effectiveness and market response, price elasticity information, and cannibalization/dilution details. In determining price elasticity, the promotion pricing system 100 may generate both the user's elasticity and cross-elasticity of other products, sales channels or incentive types on market response. The resolution of the forecasts depends on the quantity and quality of sales order and competitive data available. If individual product forecasts cannot be reliably generated, elasticity at an aggregate level (or product segment group) is generated by the promotion pricing system 100.

Detail Description Paragraph - DETX (11): [0027] Using this price elasticity information and baseline volume estimates taken as input from either the user or third party systems, the promotion pricing system 100 can compute expected lifts (i.e., sales increases) for a given promotion program in terms of quantity revenue, margin, or other industry-specific metrics. These estimates are generated at the level product, incentive type, sales channel, and marketing channel levels. The promotion pricing system 100 may then use cross-elasticity determinations to compute cannibalization or dilution effects on a given product or sales channel from competing or surrogate products and sales channels.

Detail Description Paragraph - DETX (15): [0031] The PSM 200 defines the products in the market model created and analyzed by promotion pricing system 100. Specifically, the PSM 200 creates and organizes a list of related products. As generally illustrated in FIG. 2, the PSM 200 may employ a production segmentation method 210 for collecting, organizing and presenting the product data. The user may input this data (Step 220), or the PSM 200 may collect data from a list of products, step 230. For instance, the PSM 200 may download data from a database containing product catalog information or may employ known data collection and mining techniques such as automated XML data crawling applications. Alternatively, the PSM may use defining product characteristics to select appropriated competing products in view of a list of the user's products. After acquiring the data, the PSM categorize products into product segments by similar behavior, attributes, or features, step 240. The categorization of the products may be generally accomplished by organizing the product data into a relational database and then employing standard query language (SQL) to organize the product data according to desired

characteristics. In organizing the product data, the PSM 200 may determine promotion impacting factors including impacts across segments, step 250. The PSM 200 may then list the user's own target products along with associated, competing products, step 260. In this way, the PSM 200 also defines the suppliers to the market model created and evaluated by the promotion pricing system 100.

Detail Description Paragraph - DETX (18): [0034] The CUSM 300 defines and categorizes the consumers of the products specified in by the PSM 200 in the product segmentation method 210. The user may manually provide data for the segmentation of the customers or, more typically, the CUSM 300 may automatically segment the customer according to various demographic or market information. The CUSM 300 preferably automatically segments the customers using various characteristics. For instance, commercial consumers may be divided into categories of differing business sizes and revenue levels. The CUSM 300 may operate using a customer segmentation method 310, as illustrated in FIG. 3. In the customer segmentation method 310, the CUSM 300 first collects a list of customers for the products defined by the PSM 200. As with the PSM 200, the CUSM 300 may either receive the customer list from an external source, step 320, or the CUSM 300 may automatically generate the customer list, step 330. For instance, the CUSM 300 may analyze a record of past transactions involving the products designated by the PSM 200. The CUSM 300 next reviews customer characteristics, step 340. The analysis of the customers may be generally accomplished by organizing the customer data into a relational database and then employing SQL to organize the customer data according to desired characteristics, such as geographic location. The CUSM 300 then divides the customers into different possible global customer segmentations, each with two or more segments, step 350. Using historical transaction data, the CUSM 300 may further determine cross impacts between customer segments, step 360. The CUSM then keeps only the customer segmentations without cross impact between different segments, step 370. The CUSM 300 only looks to customer categories in which sales are independent events to avoid covariance terms in the mathematical evaluation of the market model created by the promotion pricing system 100. In other words, sales to one consumer segment of the market should not effect demand from other consumer segments.

Detail Description Paragraph - DETX (24): [0040] After the PSM 200, CUSM 300, and the ITM 400 define the market to be modeled, the DAM 500 evaluates historical transactions in view of the various defined products, customers, and promotional techniques. Specifically, the DAM 500 may employ the data aggregation technique 510 depicted in FIG. 5. In step 520, the DAM 500 may separate data by customer segments. The separation may be automated or specified by the user. The DAM 500 may then determine a time interval at which to aggregate transaction volume data, step 530, on the basis of the number of time period needed to estimate parameters, the incentive offer and price variation cycle, and data collection frequency. The DAM 500 then aggregates volume data at selected time interval for target products, step 540. If the products are clearly segmented, the DAM 500 aggregates competing product volume at the same time interval, and calculates corresponding market share under each segment, step 550. The DAM 500 then compute average prices and incentive offers by each channel for each product over each time interval, step 560. The DAM 500 then uses statistical analysis techniques to determine patterns, such as seasonality, and other statistical factors, step 580. The output of the DAM 500 is typically

a relational database in which each historical transaction has been characterized by product segment, customer segment, and incentive type.

Detail Description Paragraph - DETX (27): [0043] If competitor information is available, then at determination 630, the MSM 600 decides whether a substantially complete set of product volume data is available over the time periods of interest. If a substantially complete set of product volume data is available over the time periods of interest, then the dependant variable during evaluation is sales volume, step 640, and the promotion pricing system 100 evaluates promotion efforts using a multiplicative model described in greater detail below, step 645.

Detail Description Paragraph - DETX (28): [0044] If only samples of the user's and competitors' products volume data over time is available for the time period of interest, the MSM 600 evaluates the product segments defined in the PSM 200, step 650. At decision, 660, the MSM 600 determines whether there is apparent cross impact among these segments. Likewise, at decision 670, the MSM 600 determines whether any of the promotion programs substantially overlaps over different time periods of interest. If there is an apparent cross impact among these segments or any of the promotion programs substantially overlaps over different time periods of interest, then the dependant variable during evaluation is sales volume, step 640, and the MSM 600 selects the multiplicative model for use during the promotion pricing system's 100 evaluation of promotional efforts, step 645. If there is neither an apparent cross impact among these segments nor substantial overlaps in promotions over different time periods of interest, then the MSM 600 uses market share as the dependant variable during evaluation, step 680. The MSM then decides whether there are too many products in each segment defined by the PSM 200, determination 690. Generally, the MSM 600 looks to see if the number of products in each segments exceeds a predetermined maximum. If there are too many products in each segment, the MSM 600 again selects the multiplicative model for use during the promotion pricing system's 100 evaluation of promotional efforts, step 645. If the MSM 600 determines that there are not too many products in each segment during determination 680, the MSM 600 selects an attraction model for use during the promotion pricing system's 100 evaluation of promotional efforts, step 695. The attraction model for evaluating promotions is described in greater detail below.

Detail Description Paragraph - DETX (30): [0046] In evaluating a promotion, the subjective variable of attractiveness or utility does not really exist. To calibrate the model, the user may use Market Share (actually the natural logarithm of market share) or sales volume to represent the attractiveness, or utility, of the product i, deal type j. In particular, the CM 700 evaluates the above-described inputs and produces the outputs results using different models that guide the data analysis. For instance, the CM 700 may use either a multiplicative model that measures market share or sales volumes. Alternatively, the CM 700 may use an attraction model that measures market share. Specifically, the CM 700 determines the values for the dependent variables designated above in step 640 and 690. The CM 700 further integrates new transaction data to adjust values of the dependent variable. In turn, as described below, the EM 800 uses the values for the dependant variables to access various promotional planning schemes. The operation of the CM 700 varies according to the model selected by the CSM 600.

Detail Description Paragraph - DETX (32): [0048] The multiplicative model assumes constant elasticity over market share and driver level and is defined by the following equation 1a: $1 Y_i = \exp(i + i) * k = 1 K X_k i_k$ (1a)

Detail Description Paragraph - DETX (41): [0057] As can be seen from equations 1A-1C, the dependant variable in the multiplicative model is either sales volume or market share. The use of sales volume as the dependent variable raises concerns of seasonality and trend factors in the transaction data, whereas market share tends to be more stable over different time periods. For instance, the sales volumes of many products are higher during the Christmas season regardless of promotion schemes. Furthermore, the elasticity in the multiplicative model is equal to D and is constant over market share and driver levels. Accordingly, the multiplicative model is generally dependent on the user's sales volumes data but does not look to competitors' transaction data. Also, because it is easy to aggregate sales volume over multiple time periods, it is fairly simple to incorporate data from different time periods.

Detail Description Paragraph - DETX (43): [0059] In comparison with the multiplicative model, the attractive model uses only market share as a dependent variable and assumes constant total sales quantities. In this way, the attraction model incorporates data from competitors' transactions. Specifically, the attraction model uses the following equation to measure a product's utility and to quantify any change in the value or "utility" of product caused by a promotion. $4 A_i = \exp(a_i + i) k = 1 K f_k (X_k i) k$ (2A)

Detail Description Paragraph - DETX (60): [0076] Even greater accuracy in the attraction model may be achieved by the promotion pricing system by adding new influences to the model to reflect a more realistic market. Particularly, the influences of the competitor's product can be added to the calculation of the utility of a product. This modification addresses the possibility of cross-impacts caused by similar competitive products that can influence the attraction of the product being considered. Equation 2B is thereby modified to product equation 2C: $7 A_i = \exp(i + i) k = 1 K_j = 1 m f_k (X_k i) k_i$ (2C)

Detail Description Paragraph - DETX (72): [0088] As can be seen from above equations 2A-2D, the elasticity in the attraction model varies by market share and driver levels.

Detail Description Paragraph - DETX (85): [0098] The CM 700 operates using several assumptions to improve accuracy as well as decrease required processing time. For instance, the CM 700 assumes that there is no cross impact between customer segments. Please note however, that there may be cross-impact among product segments, e.g., a promotion of computers may indirectly promote the related peripherals. Furthermore, with the multiplicative model, the value for share or volume elasticity is assumed to be equal to a corresponding .beta..sub.ki, as defined below. Likewise, for the attraction model, the market size for each product segment is fixed at a specific time period, and all market segments should be includes or .SIGMA.S.sub.i=1.

Detail Description Paragraph - DETX (88): [0101] The EM 800 accesses the promotion scheme using the calibration results produced by the CM 700 in method 710. Specifically, the EM 100

uses the evaluation method 810 is depicted in FIG. 8. During evaluation, the EM 800 receives baseline information from the user, including sales volume information for the attraction model, information of the user's promotions, and competitors to the related products ups, assuming the same promotions existing offers across customer segments, step 820. If the market share is predicted by the multiplicative model, the share elasticity should be evaluated instead of volume in step 820. The user may also inputs values for predicting variables to get responses for an adjusted program, though incentive offers to one customer segment could be distinctive from the other, step 830. For the attraction model, the user may input the total base line volume $V_{\text{sub},i}$ for the product over interest over the defined customer segments, the baseline volumes for other choice sets can be derived by market shares and overall customer segment ratio as following. For example,

Detail Description Paragraph - DETX (95): [0104] When performing profit maximization, the EM 800 predicts the ability of the promotion scheme to change profits, step 845. The EM 800 looks to the sales price and the expected change in sales for a product. The EM 800 then uses these values to estimate expected revenues attributable to the promotion scheme. Where in the EM 800 cannot measure costs, it proposes a revenue maximizing promotion scheme. The EM 800 may also receive an estimate of costs produced by the COSM 1000, as described below. The EM 800 may then find the expected profits attributed to the promotion scheme by subtracting estimated costs from the estimated revenues.

Detail Description Paragraph - DETX (102): [0111] The COSM 1000 functions to determine costs for the promotion schemes. As described in the cost organization method 1010 and illustrated in FIG. 10, the COSM 1000 first determines base product cost without the promotion scheme, step 1020. The COSM then determines indirect promotion costs caused by the promotion scheme, step 1030. In particular, the COSM 1000 looks to, for example, the increased costs per unit associated with increased sales volume or share from the promotion. The COSM 1000 next determines the direct costs for the promotional scheme, step 1040. For instance, the COSM 1000 may determine incentive costs, offer channel cost, customer segment cost, order channel cost, etc. The COSM 1000 then sums the indirect and direct promotion scheme costs to determine a total cost.

Detail Description Paragraph - DETX (114): [0123] The OM 1100 allows the user to select the promotion that maximizes profit, subject to certain constraints. This is particularly useful if the market response model incorporates cannibalization or affinity relationships. As illustrated in FIG. 11, the OM 1100 employs an optimization method 1110. The first step 1120 is to define an offer template. This generally consists of product/sales channel combinations, target customer segment, target incentive type and a time period. These may be defined according to previously defined methods, 210, 310, 410, and 510. An offer is made to a list of choices, where a choice is a combination of customer segment, product, and channel. For each choice, there is an incentive type (e.g. cashback, discount), and an incentive level (e.g. \$20 off, 5% off). An offer template has the same form as an offer, with the following exception. An offer has associated incentive levels (e.g. level of discount, APR). For example, printer at 20% off, computer at \$100 off (assuming "printer" and "computer" are choices). In an offer template, some of the incentive levels that take on real values may be set to be VARIABLE. So, for example, printer at VARIABLE %

off, computer at \$100 off might be part of an offer template. Each offer template has instances associated with it. For example, printer at VARIABLE % off, computer at \$100 off would have, as an instance, printer at 20% off, computer at \$100 off.

Detail Description Paragraph - DETX (125): [0134] In step 1140, the OM 1100 determines the optimal offer. Specifically, the OM 1100 aims to solve (or approximately solve) the problem of considering all the offers that are instances of this offer template. The OM 1100 further considers the subset of these that satisfy the constraints. Each such offer will have an associated profit, and the OM 1100 finds the one that gives the largest profit and uses this as the optimal offer.

Detail Description Paragraph - DETX (130): [0139] The promotions system 100 then determines the number of consumers reached if certain direct channel is chosen as well as which direct marketing channel to choose in order to achieve high margin and what incentive offer gives higher margins. The promotion system 100 further determines expected propensity of a promotion offer, expected number of sales of a promotion offer, expected incremental costs of a promotion offer, and expected incremental profits of a promotion offer.

Detail Description Paragraph - DETX (135): [0144] The time period transaction data is aggregated to generate business metrics. It is also the time unit each forecast value is based upon. For actual vs. forecast alerts, it is time unit which forecast is made upon depending on the time unit for the calibration process. The AM 1300 defines this time unit as the basic time unit. For other types of alert, it could be anything beyond the basic time unit, and it is highly desirable to have other time units. For instance, if the basic time unit is made at weekly level, the time unit could be week, month, quarter, and year, etc for alerts of current period vs. previous period.

Detail Description Paragraph - DETX (143): [0152] Basic alert types include actual vs. forecast, current time period vs. previous period, same variation trend, and year over year comparison. The actual vs. forecast alert is generated by comparison of actual values in the current time period to the forecast value. The baseline value is forecast value for current time period. For instance, if the actual sales of button down shirt for last week were 1000 units less than the forecast, this type of alert would be stimulated. An actual vs. forecast alert may be promotion focused, i.e. only promotion-associated sales can be involved in such alert, because the forecast in current release is at promotion level. Alternatively, a general forecast or planning enables a more general actual vs. forecast alert. The current time period vs. previous period alert is generated when actual values for current time period are deviated from the previous time period at certain degree. The baseline value may be the actual values for the previous time period. For instance, if the actual sales of button down shirt for February were 1000 units less than those of January, such type of alert would be stimulated.

Detail Description Paragraph - DETX (149): [0157] The operation of the promotion system 100 and the use of drivers are now explained through the following example that describes the creation of a promotion pricing model for a manufacturer. In the following example, it is supposed that three types of incentives are offered by the Manufacturer for its truck--a cash rebate, low finance and a lease rate. Logically, the truck finance and the truck lease drivers are the price paid by the

customer per month, so by construction they will never be null. If the Manufacturer decides not to give any cash rebate for its Truck (no incentives for cash back), the driver price still won't be null for mathematical purposes because at some point in the process of calculating the utility of Truck, the log of the drivers will need to be calculated and therefore, the drivers cannot be null. The promotions system 100 operates to prevent null values for the drivers that may preclude or adversely impact the evaluation of the promotions. The following Table 1 represents the different incentives that may be offered by the Manufacturer as well as the drivers effected by these incentives.

Detail Description Paragraph - DETX (185): [0192] If providing Volume.sub.Sedan,Base,Young is still difficult to users, users can estimate Volume.sub.Sedan,Base. The Promotion Pricing system 100 may calculate the conditional probabilities from the database, Prob(Vol.sub.Sedan,young.vertline.Vol.sub.Sedan,old+young), and then computer Volume.sub.Sedan,Base,Young.

Detail Description Paragraph - DETX (245): [0237] In this example, the promotion pricing system may estimate the variable m first, i.e., estimate for a product, deal-type, sub-segment, customer segment, and channel, how many .beta. needs to be calculated. The following table fixes the value of each constant:

Claims Text - CLTX (2): 1. A method for evaluating a promotion scheme for a product, the method comprising the steps of: creating a model of a market for the product; collecting historical transaction data related to the product in the market; analyzing the historical data and the model to determine a utility of the product without the promotion scheme; and estimating the change in utility of the product from the promotion scheme.

Claims Text - CLTX (20): 19. The system of claim 15 further comprising a market channel performance model.

Claims Text - CLTX (26): 25. A program storage device readable by a machine, tangibly embodying a program of instructions executable by a machine to perform method steps creating a model of a market for the product; collecting historical transaction data related to the product in the market; analyzing the historical data and the model to determine a utility of the product without the promotion scheme; and estimating a change in utility of the product from the promotion scheme, whereby the method step of estimating uses either a multiplicative or an attraction model.